NORTHWEST MOUNTAIN REGION RUNWAY INCURSION ACTION TEAM EVALUATION
Boise Airport
August 30, 2001

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Regional Runway Safety Program Manager

Northwest Mountain Region
Federal Aviation Administration

Definition of Runway Incursion

Any occurrence at an airport involving:

- **an aircraft**
- **a vehicle**
- **a person**
- **or an object**

on the ground that creates a collision hazard or results in loss of separation with an aircraft taking off, intending to take off, landing, or intending to land.
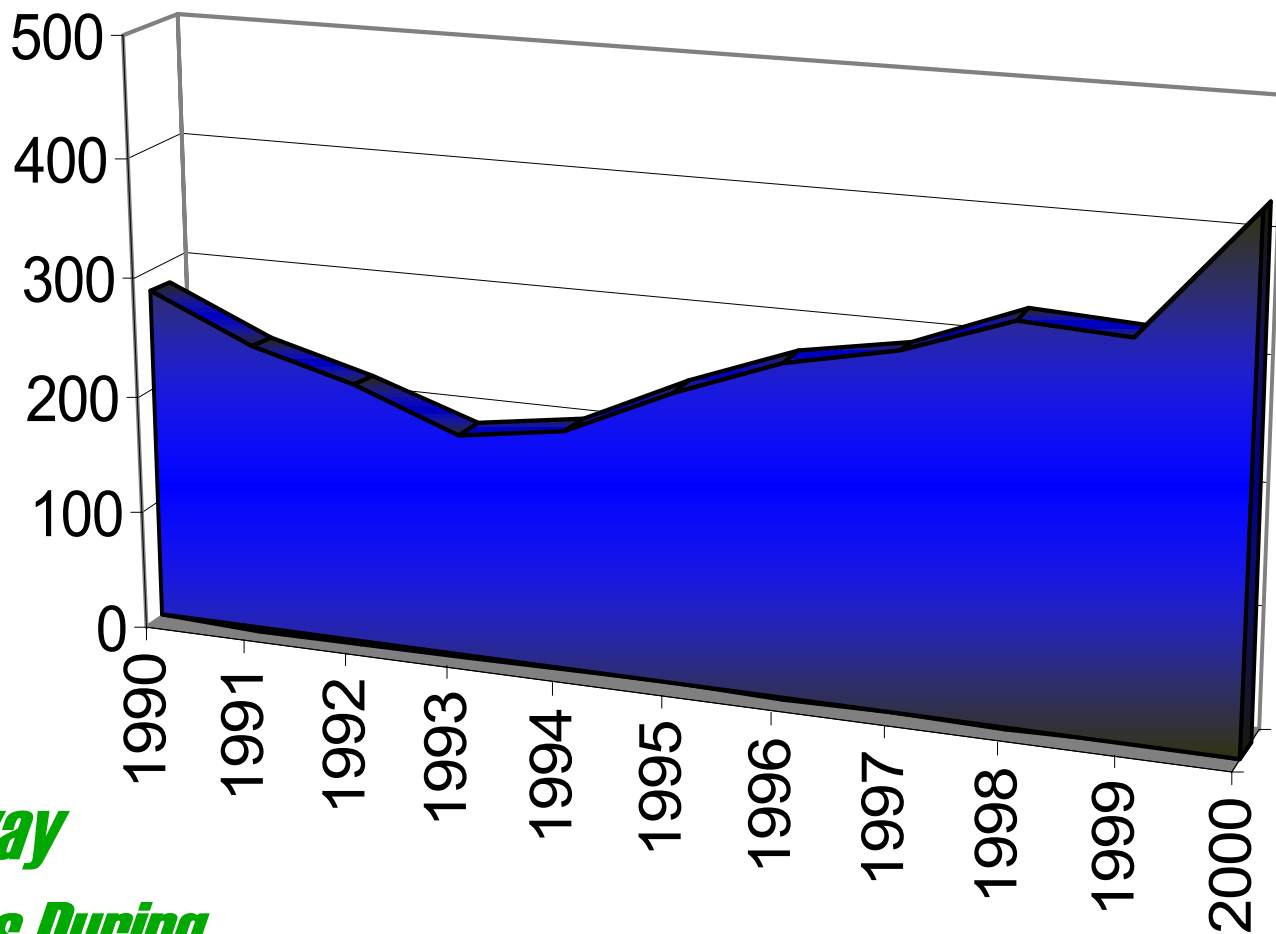
Sedan versus DC-10

Runway Incursion Types

Runway incursions result from three types of surface incidents:

- **Operational Errors (OE)**

- **Pilot Deviations (PD)**
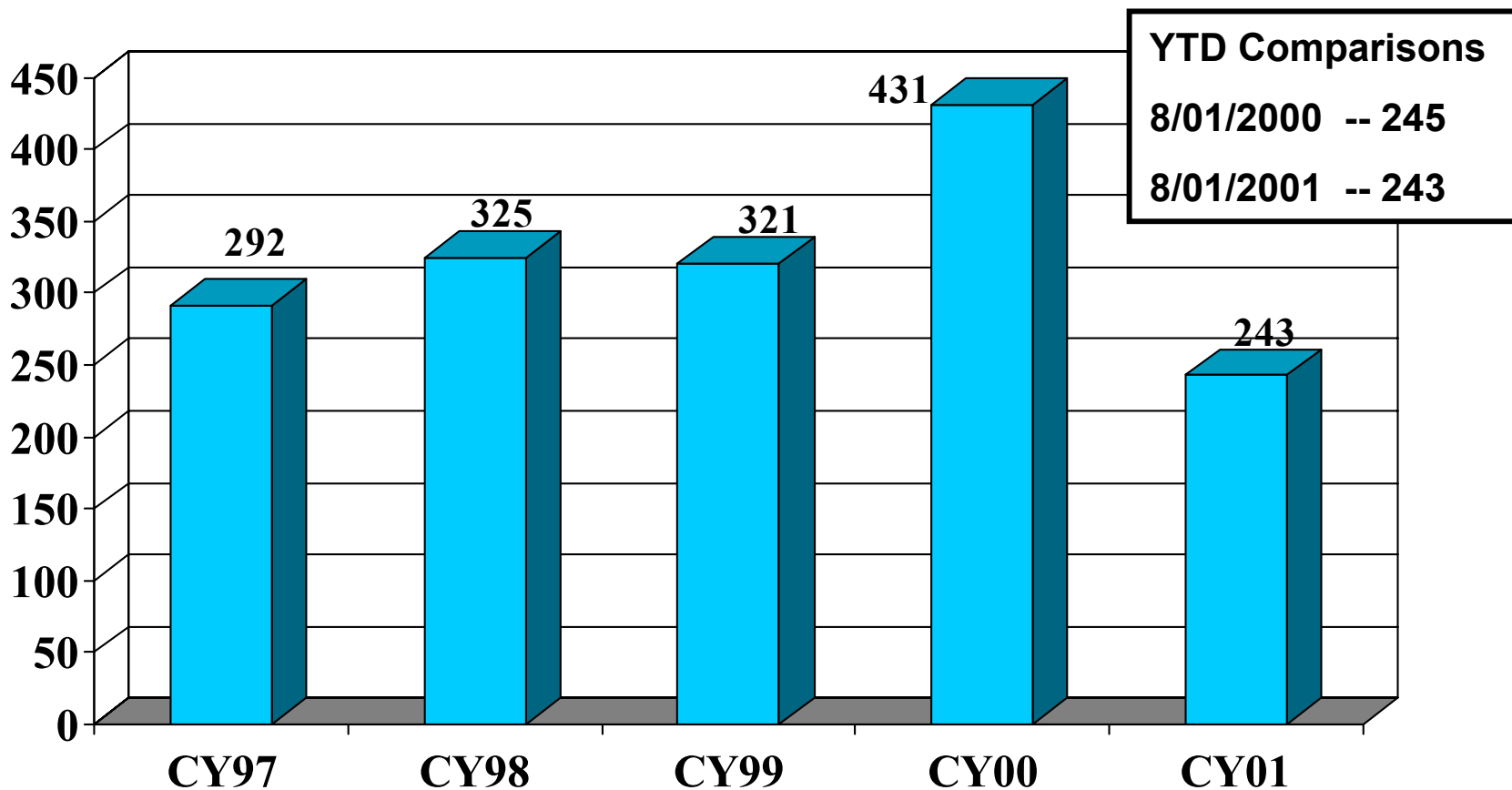
- **Vehicle/Pedestrian Deviations (V/PD)**
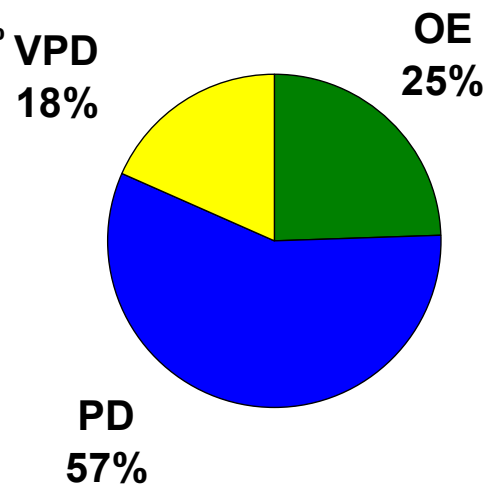
Trends

431 Runway Incursions During CY 2000

RUNWAY INCURSIONS
CY97 to DATE
(as of 8/01/01)

Runway Safety Program — Federal Aviation Administration

YTD Comparisons

8/01/2000 -- 245

8/01/2001 -- 243

Year	Value
CY97	292
CY98	325
CY99	321
CY00	431
CY01	243

Trends - **Incursions by type**

1998
OE 28%
VPD 16%
PD 56%

1999
OE 24%
VPD 19%
PD 57%

2000
OE 20%
VPD 20%
PD 60%

Thru 21 Aug 2001
OE 25%
VPD 18%
PD 57%
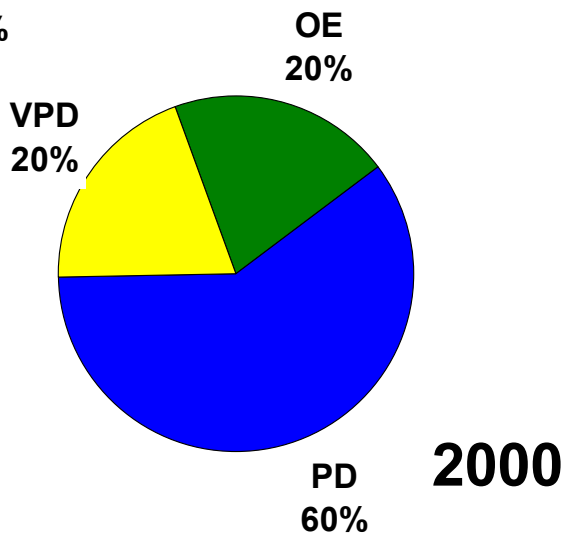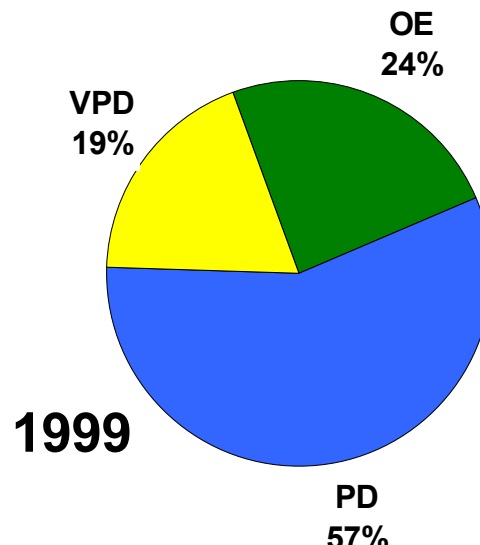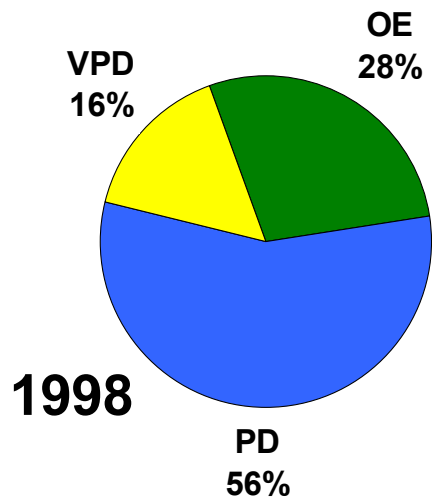
Trends

Pilot Deviations by operations type
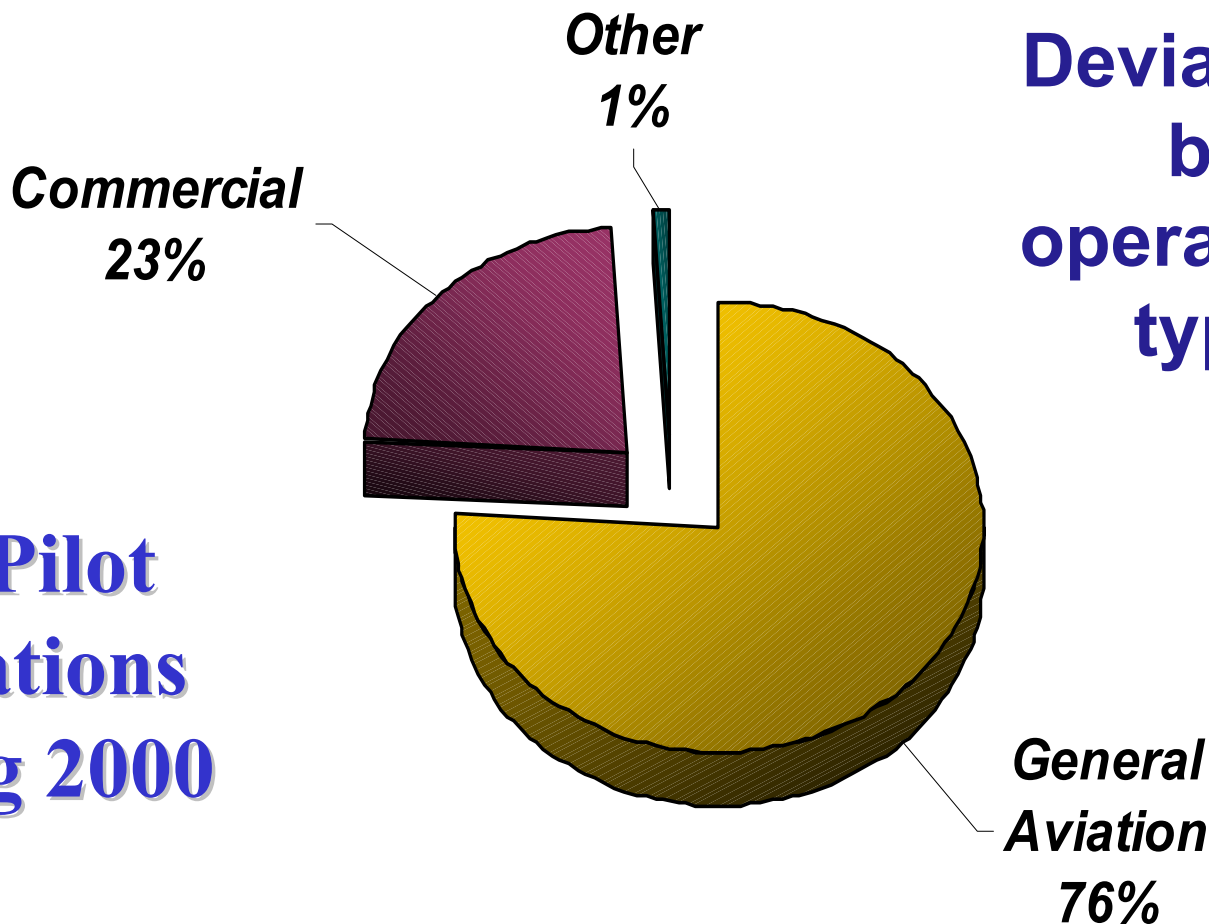
256 Pilot Deviations during 2000

Other
1%

Commercial
23%

General Aviation
76%

Top Incursion Airports
CY 2000

LOCATION	LOC ID	OPS	RI	RATE
North Las Vegas Arpt, NV	VGT	229,703	16	6.97
Montgomery Field/San Diego, CA	MYF	260,235	9	3.46
Fort Lauderdale Exec, FL	FXE	263,359	9	3.42
Merrill Field, Anchorage, AK	MRI	201,148	8	3.98
Long Beach Arpt, CA	LGB	416,766	8	1.92
Logan Arpt, Boston, MA	BOS	512,985	8	1.56
Los Angeles, CA	LAX	786,421	8	1.02
Jeffco Arpt, Denver, CO	BJC	177,319	7	3.95
Concord Arpt, CA	CCR	212,112	7	3.30
Orange Co/John Wayne Arpt, Santa Ana, CA	SNA	405,473	7	1.73
Santa Barbara, CA	SBA	163,865	6	3.66
Lambert Fld, St. Louis, MO	STL	490,779	6	1.22
Phoenix Sky Harbor Arpt, AZ	PHX	632,360	6	0.95
Troutdale Arpt, OR	TTD	76,252	5	6.56
Teterboro Arpt, NJ	TEB	272,201	5	1.84

Top Incursion Airports
CY 2000

LOCATION	LOC ID	OPS	RI	RATE
San Jose Arpt, CA	SJC	300,365	5	1.67
Bridgeport, CT	BDR	90,760	4	4.41
Greater Rockford Arpt, IL	RFD	94,571	4	4.23
McGhee Tyson Airport Knoxville, TN	TYS	152,330	4	2.63
Providence, RI	PVD	157,470	4	2.54
Sarasota/Bradenton Arpt, FL	SRQ	174,515	4	2.29
Palwaukee Muni, Chicago, IL	PWK	185,236	4	2.16
Albuquerque, NM	ABQ	233,632	4	1.71
Midway Arpt, Chicago, IL	MDW	303,192	4	1.32
Salt Lake City, UT	SLC	370,681	4	1.08
San Francisco, CA	SFO	437,186	4	0.92
Newark, NJ	EWR	461,457	4	0.87
Cincinatti-Covington Arpt, OH	CVG	486,590	4	0.82
O'Hare, Chicago, IL	ORD	914,131	4	0.44

Sweeper versus DC-9

RISK ASSESSMENT

Why We Assessed Data

- As a result of feedback from 2000 Summit, needed to place runway incursions into another context

- Need a better way to track incursions

- Need a better understanding of where incursions happen

- Need a way to analyze data to get at causal factors

- Need to describe clearer picture of runway incursion incidents – *Not every incursion is a Tenerife*

What Was Done

- Formed a team of "experts" to assess incursions in detail

- Developed four runway incursion categories – coordinated with ASD and other agency analysis activities (Dr. A. Barnett)

- Mitre and NASA ASRS observed and validated the process

Definitions

A Separation decreases to a point where the margin of safety is so low that the participants <u>barely avoid a collision</u>.*

B Separation decreases to a point where a <u>significant potential for a collision</u> existed.

C Separation decreases, or the potential for separation to decrease exists, <u>but ample time and distance exist</u> to avoid a potential collision.

D Meets the definition of a runway incursion, with <u>little or no risk of a collision</u>.

* **The data contained in category A includes all accidents that occurred as a result of runway incursions (1997-2000), one in LaGuardia, NY & one in Sarasota, FL.**

Assessment Process

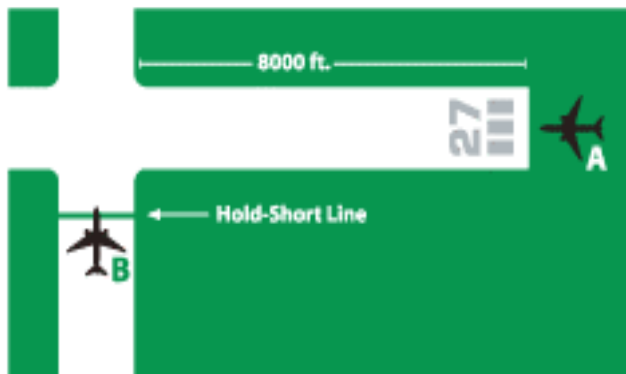Evaluated over 1350 incidents – all incursions during 1997 – 2000 – *one at a time*

- Projected airport diagram
- Projected all reported incident information
- "Walked-thru" incident and discussed event
- Reached Team consensus and assigned collision risk category (A-D)
- Asked 20+ questions for every incident to collect additional data
- Marked incident location on airport diagram

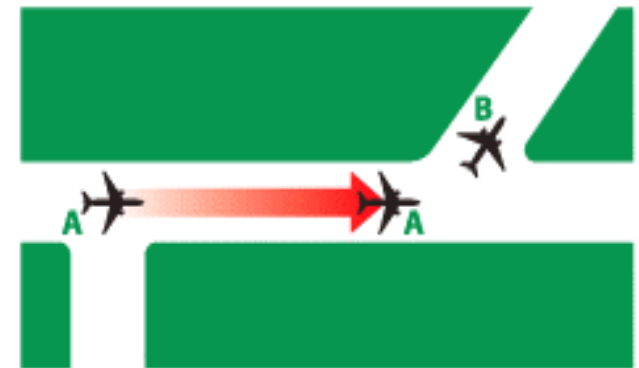# Not all runway incursions are "created equal"

Case 1

This incident meets the definition of a runway incursion, but there is little or no chance of collision.
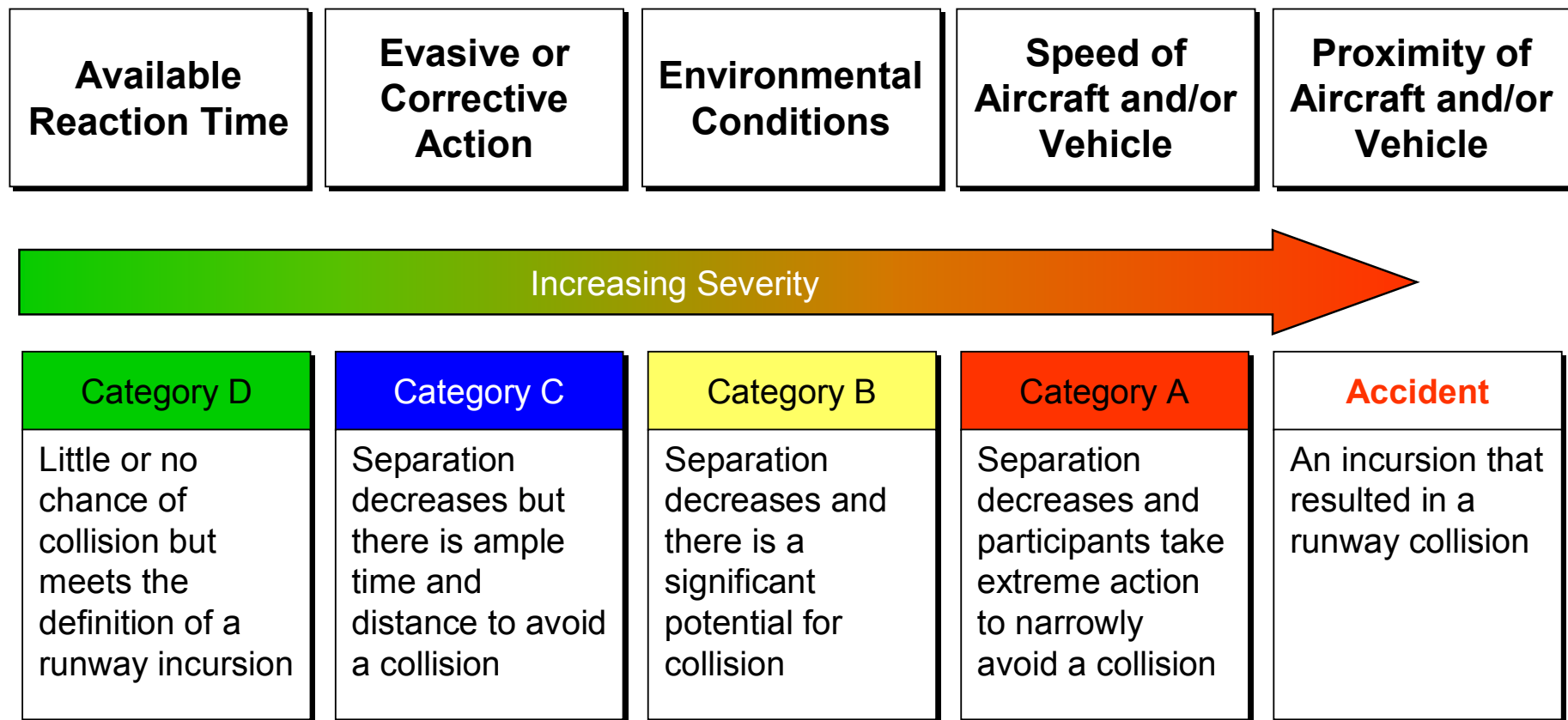
Case 2

This is a severe situation where the margin of safety is so low that a collision is barely avoided.

- ▸ The potential for a collision is low

- ▸ Most frequently reported incursion

- ▸ Potential for a collision is high

- ▸ Typifies the common perception of a runway incursion
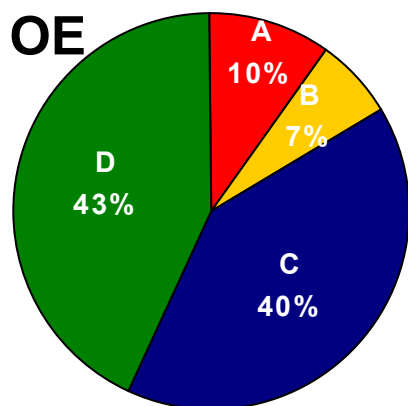
- ▸ More severe but less frequent

Runway Incursion Severity

The two simple cases illustrate that a variety of dimensions can dramatically impact the severity of a runway incursion.
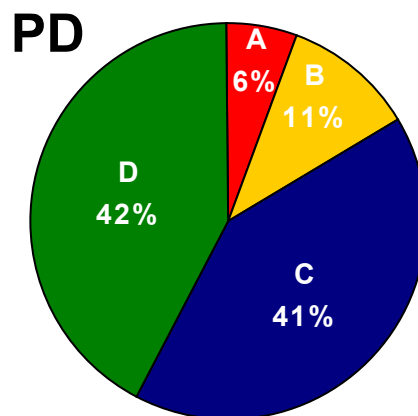
Available Reaction Time	Evasive or Corrective Action	Environmental Conditions	Speed of Aircraft and/or Vehicle	Proximity of Aircraft and/or Vehicle

Increasing Severity

Category D	Category C	Category B	Category A	Accident
Little or no chance of collision but meets the definition of a runway incursion	Separation decreases but there is ample time and distance to avoid a collision	Separation decreases and there is a significant potential for collision	Separation decreases and participants take extreme action to narrowly avoid a collision	An incursion that resulted in a runway collision

RUNWAY INCURSIONS
CALENDAR YEAR (CY) TO DATE
TYPE BY CATEGORY
AS OF 08/01

OE

A 10%
B 7%
D 43%
C 40%

PD

A 6%
B 11%
D 42%
C 41%

V/PD

B 2%
C 25%
A 0%
D 73%
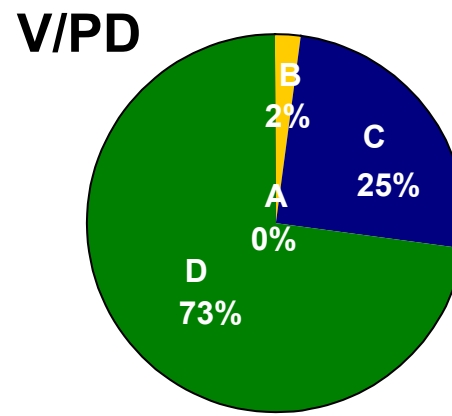
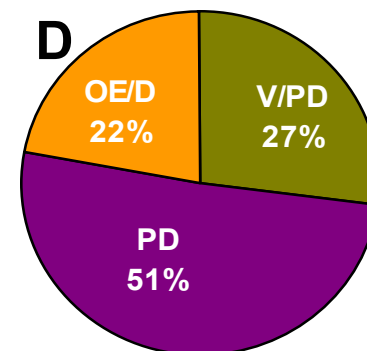|	OE	PD	V/PD
CY2001 YTD TOTAL 243	60	139	44
CY2000 YTD TOTAL 245	44	151	50

RUNWAY INCURSIONS
CALENDAR YEAR (CY) TO DATE
CATEGORY BY TYPE
AS OF 08/01

A
- V/PD 0%
- OE/D 43%
- PD 57%

B
- V/PD 5%
- OE/D 20%
- PD 75%

C
- V/PD 13%
- OE/D 26%
- PD 61%

D
- V/PD 27%
- OE/D 22%
- PD 51%
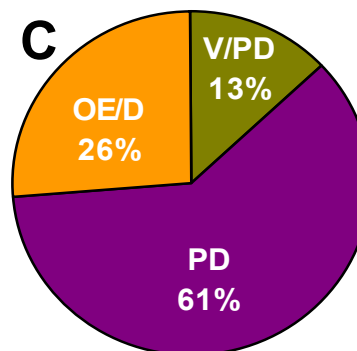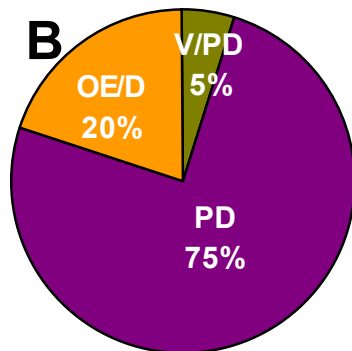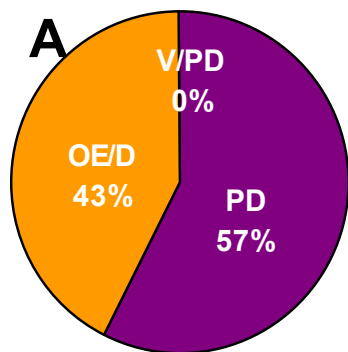
CATEGORY	A	B	C	D
CY2001 YTD TOTAL 243	14	20	92	117
CY2000 YTD TOTAL 245	14	31	82	118

Severity Distribution of Reported Runway Incursions
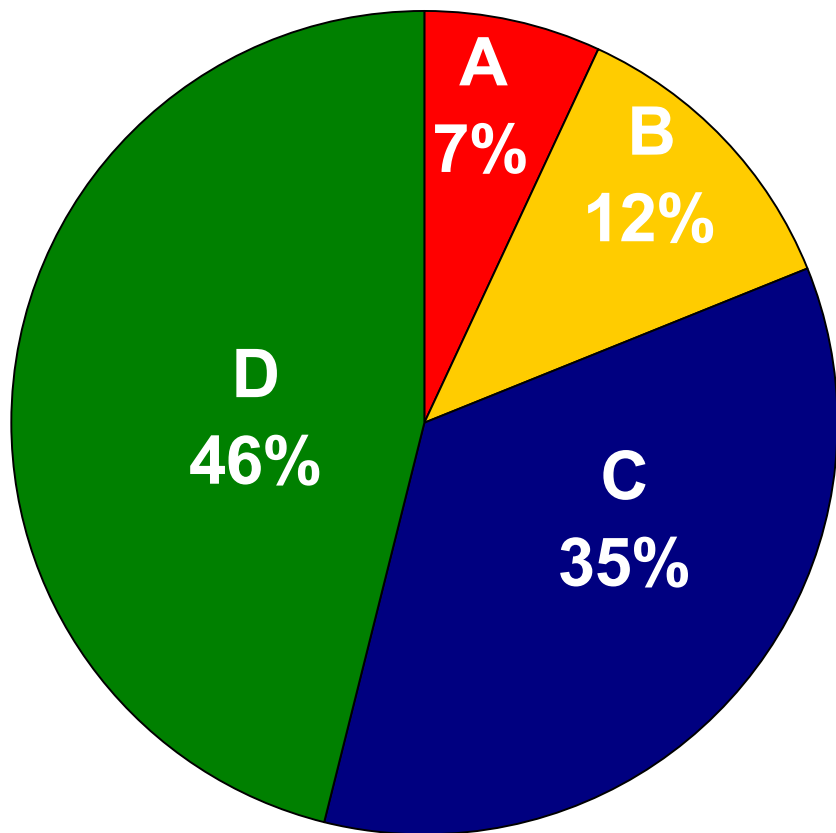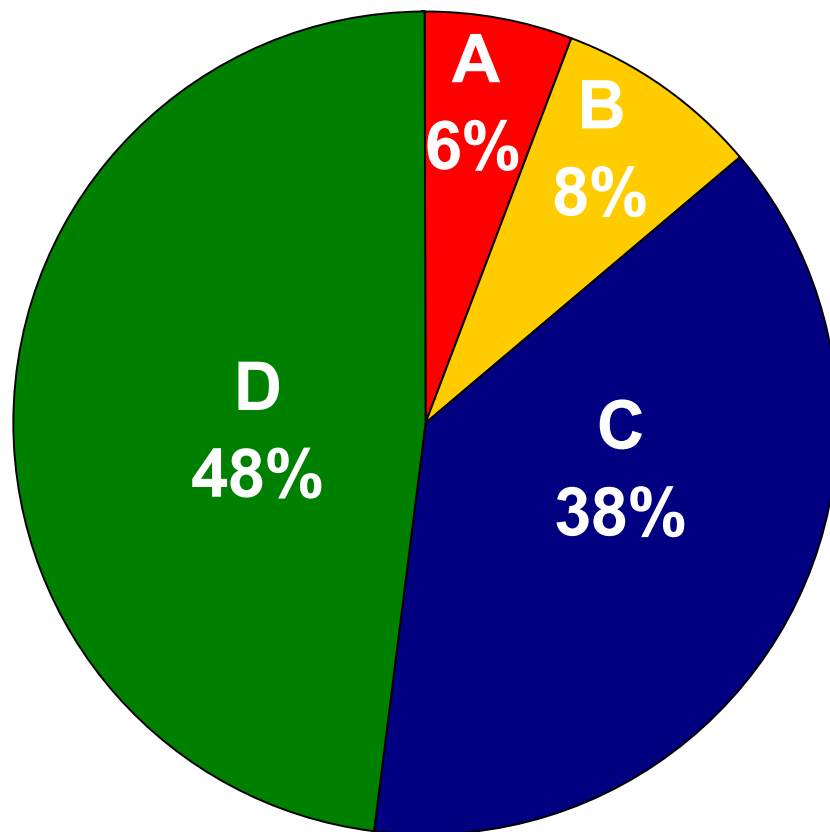
1997-2000

Pie chart:
- A 7%
- B 12%
- C 35%
- D 46%

YTD 2001 (8/1)

Pie chart:
- A 6%
- B 8%
- C 38%
- D 48%
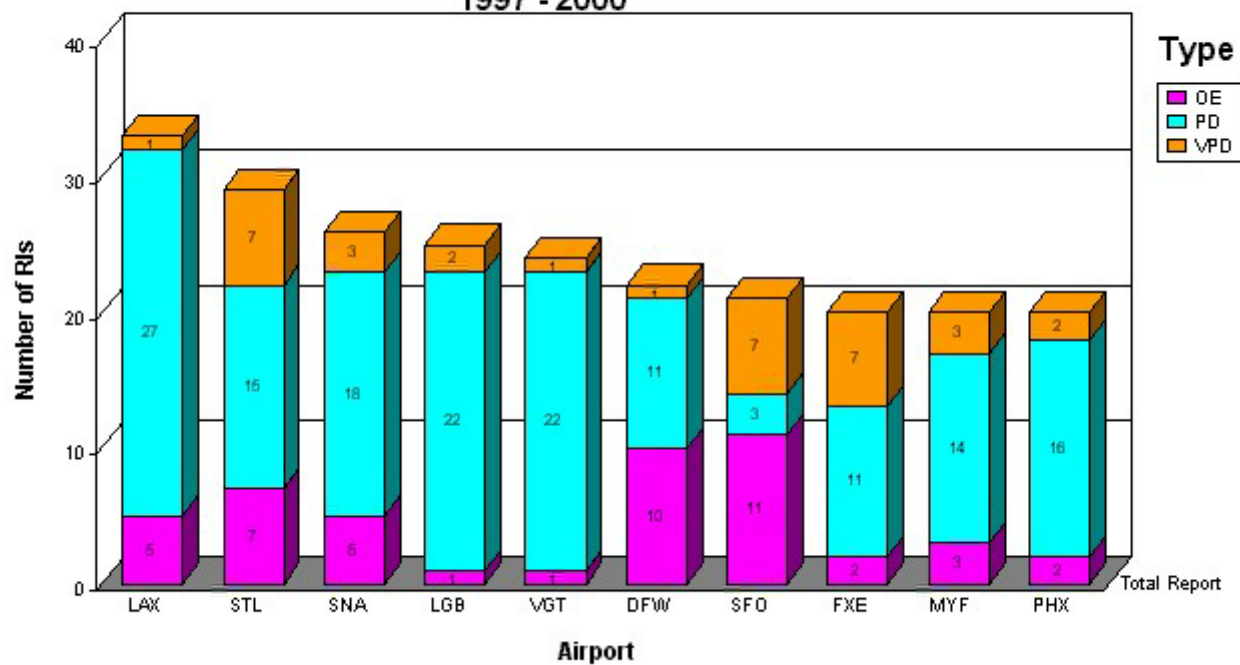
Number of Reported Runway Incursions by Severity

Figure 4.
Severity Distribution of Reported Runway Incursions 1997–2000

Category A — 7%
Category B — 12%
Category C — 35%
Category D — 46%

Total =1359

Number of Reported Runway Incursion by Severity

Legend: A, B, C, D, Total
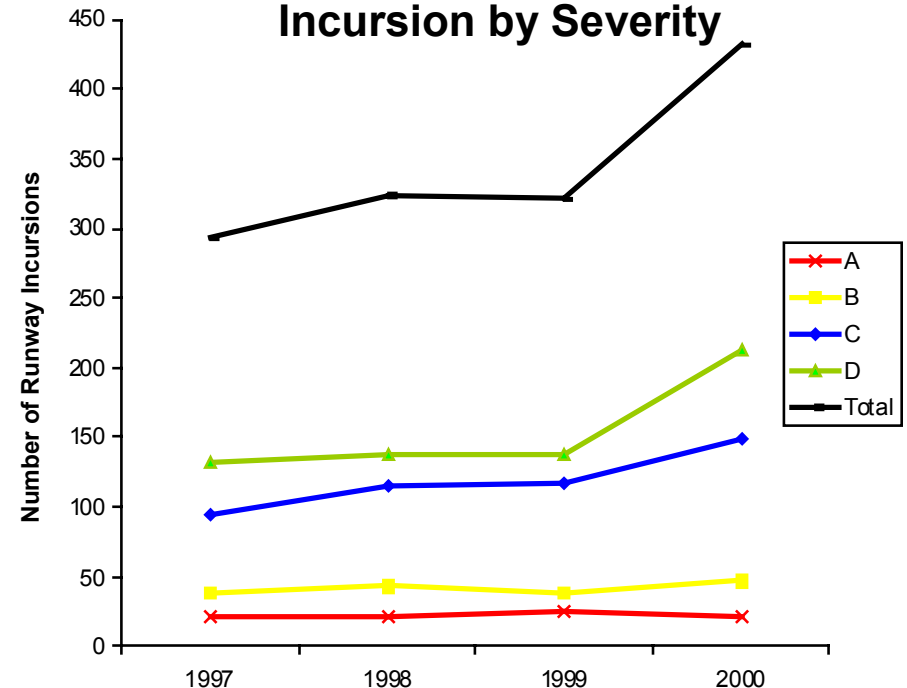
Note:
- *The total numbers are: 292, 325, 321, 431*
- *Accidents are listed as A events (1accident in 1997, 2 accidents in 2000)*
- *Does not include 10 events with insufficient data*

▸ The distribution of runway incursion severity categories from 1997 to 2000 indicates that the majority (81%) of the incidents was comprised of Category C & D events.

▸ There were 110 more reported runway incursions in 2000 than in 1999. Category C & D events accounted for 106 out of these 110 events.

10

Runway Incursions as of 21 Aug 2001
Total = 257

% of Total Runway Incursions

Legend:
- AAL
- ANE
- ACE
- ANM
- AEA
- ASW
- AGL
- ASO
- AWP

AWP 31%
AAL 2%
ANE 4%
ACE 5%
ANM 6%
AEA 9%
ASW 10%
AGL 13%
ASO 20%
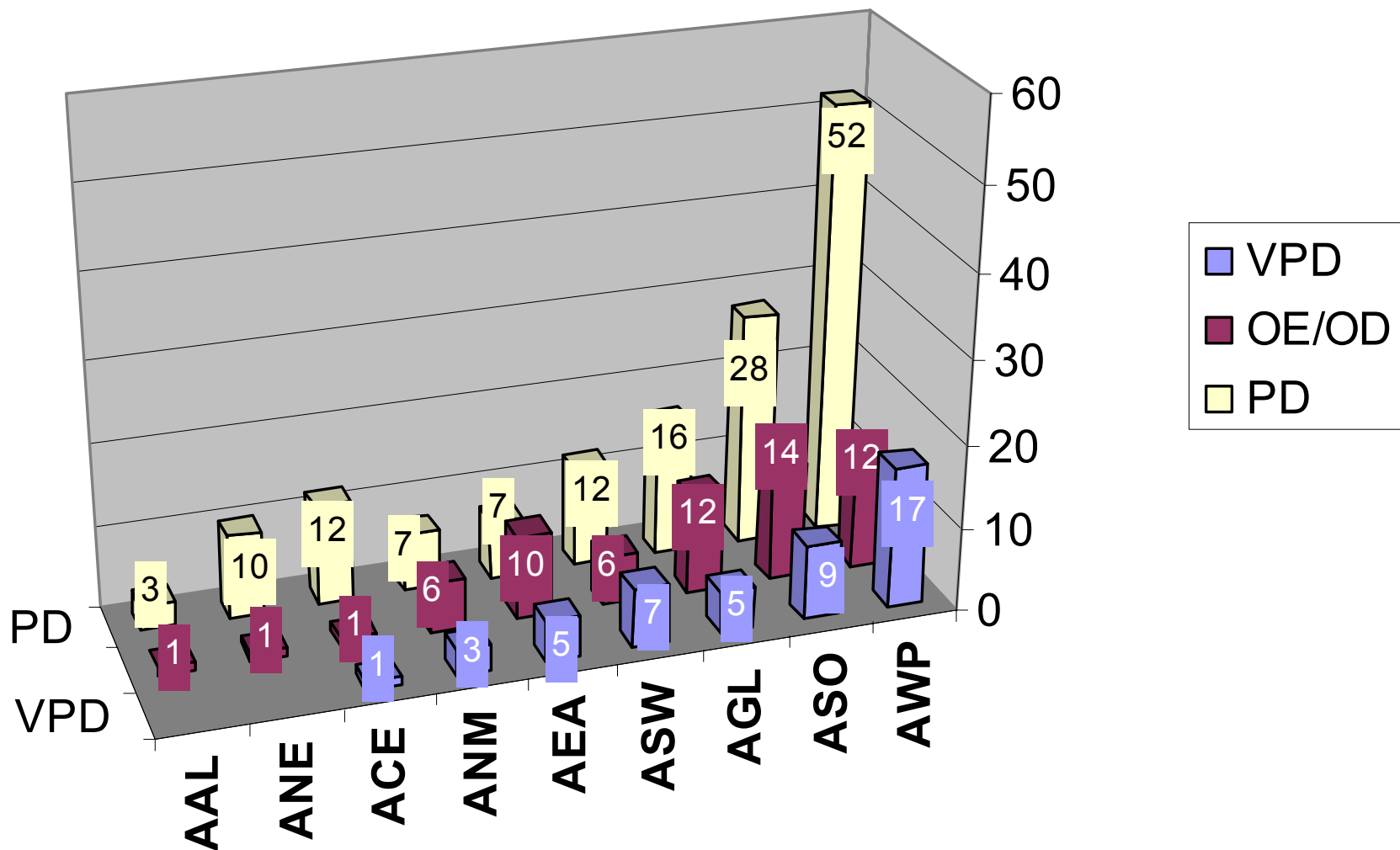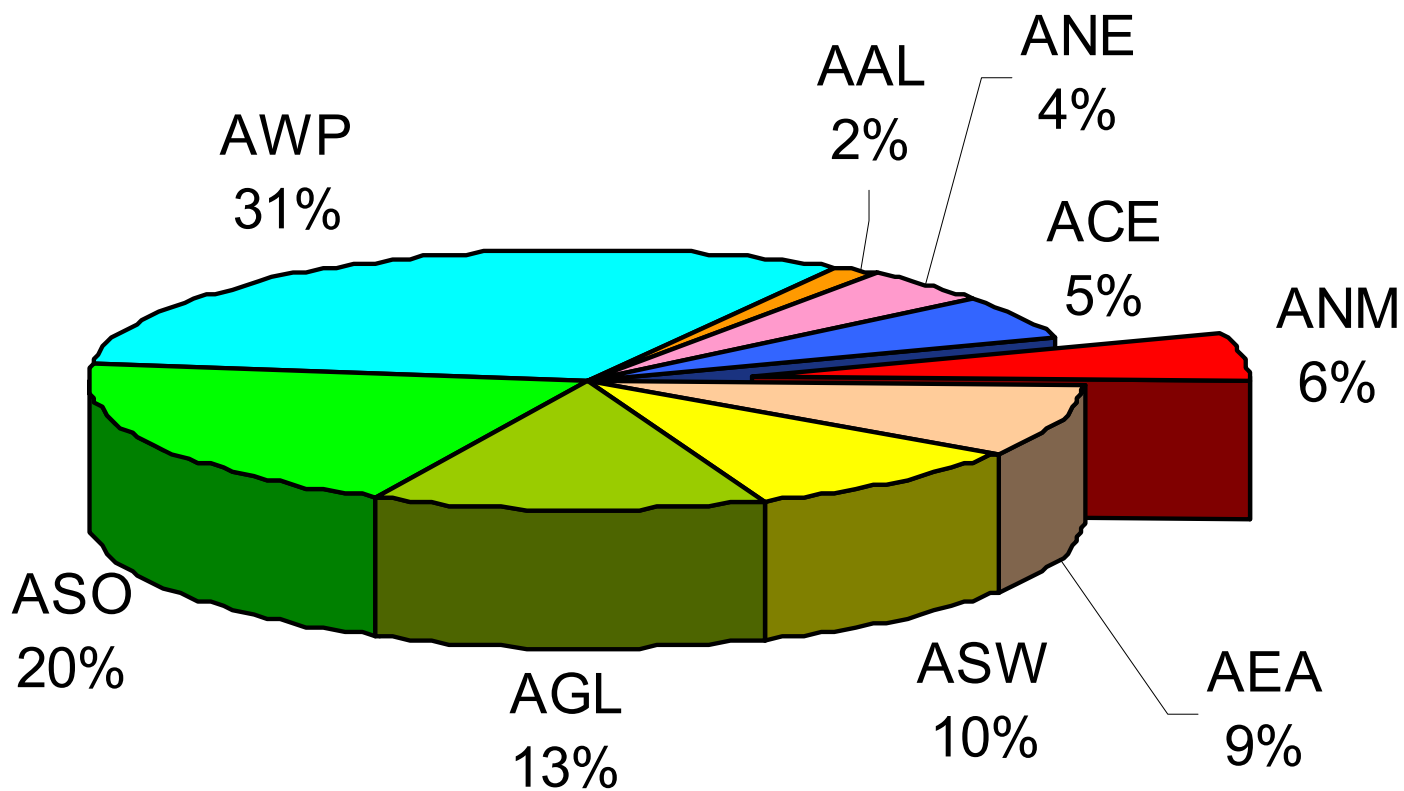
Primary Causes of Runway Incursions

- Breakdown in Pilot/Ground Vehicle/Controller Communications

- Lack of Airport Familiarity

- Loss of Situational Awareness

Snow Plow versus Wingtip

File   Edit   View   Favorites   Tools   Help

Back   Forward   Stop   Refresh   Home   Search   Favorites   History   Mail   Print

Address http://www.faa.gov/runwaysafety/   Go   Links »

Runway Safety Program
on the ground

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▶ The Cockpit
▶ The Tower
▶ On the Ground
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Create your own Airport Runway Safety Website, *FREE*!

In an effort to promote safer surface operations, the Runway Safety Program now offers all airports, regardless of size or use, the ability to create their own websites. Airports can now inform the flying public about airport hot spots, local procedures, operations, runways specifications, communications, and much more. Airports will even have the option of posting pictures and diagrams. ▶ create website

Airport Signs, Markings & Lighting

Knowing airport signs, markings & lighting is the cornerstone to safe surface operations. Take a few minutes and review the current standards. ▶view

4-AP B

We Listen...We Respond   Internet

Start   Microsoft Word   Lotus cc:Mail - [Mailbox #1 ...   Microsoft PowerPoint - [AA...   Runway Safety - Micr...   5:19 PM

File   Edit   View   Favorites   Tools   Help

Back   Forward   Stop   Refresh   Home   Search   Favorites   History   Mail   Print

Address http://www.faa.gov/runwaysafety/   Go   Links »

Runway Safety Program

statistics & data

STATISTICAL DATA

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▶ **Runway Incursion Totals CY00 vs. CY99 (Updated Daily)**

▶ **Regional Runway Incursion Totals - CY00 (Updated Daily)**

▶ **Runway Incursion Totals CY00 vs. CY99**

▶ **2000 Runway Incursion Reduction Goal**

▶ **Runway Incursions by Category (1988-1999)**

▶ **Runway Incursions by Month (1997-1999)**

▶ **Runway Incursion Rates with Total Operations (1988-1999)**

▶ **Quarterly Operational Errors (1997-1999)**

▶ **Quarterly Pilot Deviations (1997-1999)**

▶ **Pilot Deviations by Part (1997-1999)**

We Respond   We Listen...   Internet

Start   Microsoft Word   Lotus cc:Mail - [Mailbox #1 ...   Microsoft PowerPoint - [AA...   Runway Safety - Micr...   6:01 PM

National
Blueprint

for

Runway
Safety

October 2000

www.faa.gov/runwaysafety

FAA Runway Safety Report
Runway Incursion Severity Trends at Towered Airports in the United States

1997–2000

FAA Office of Runway Safety

June 2001
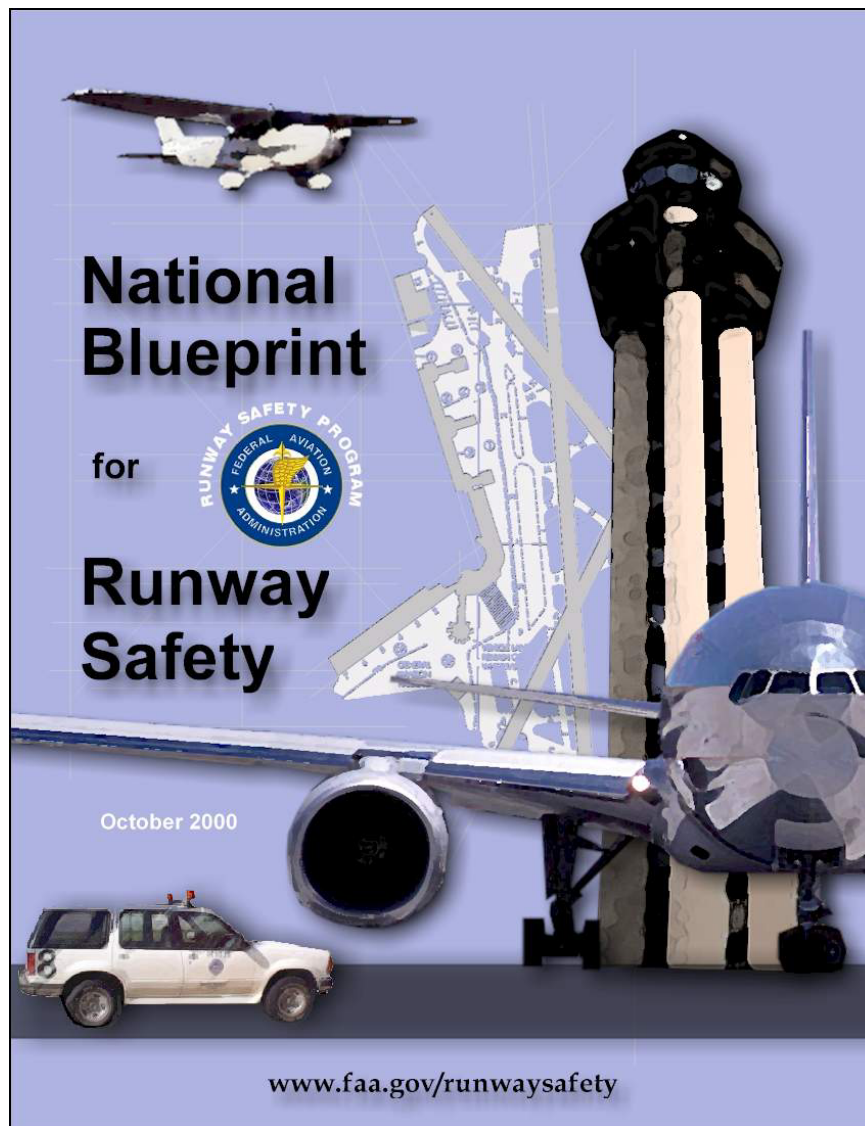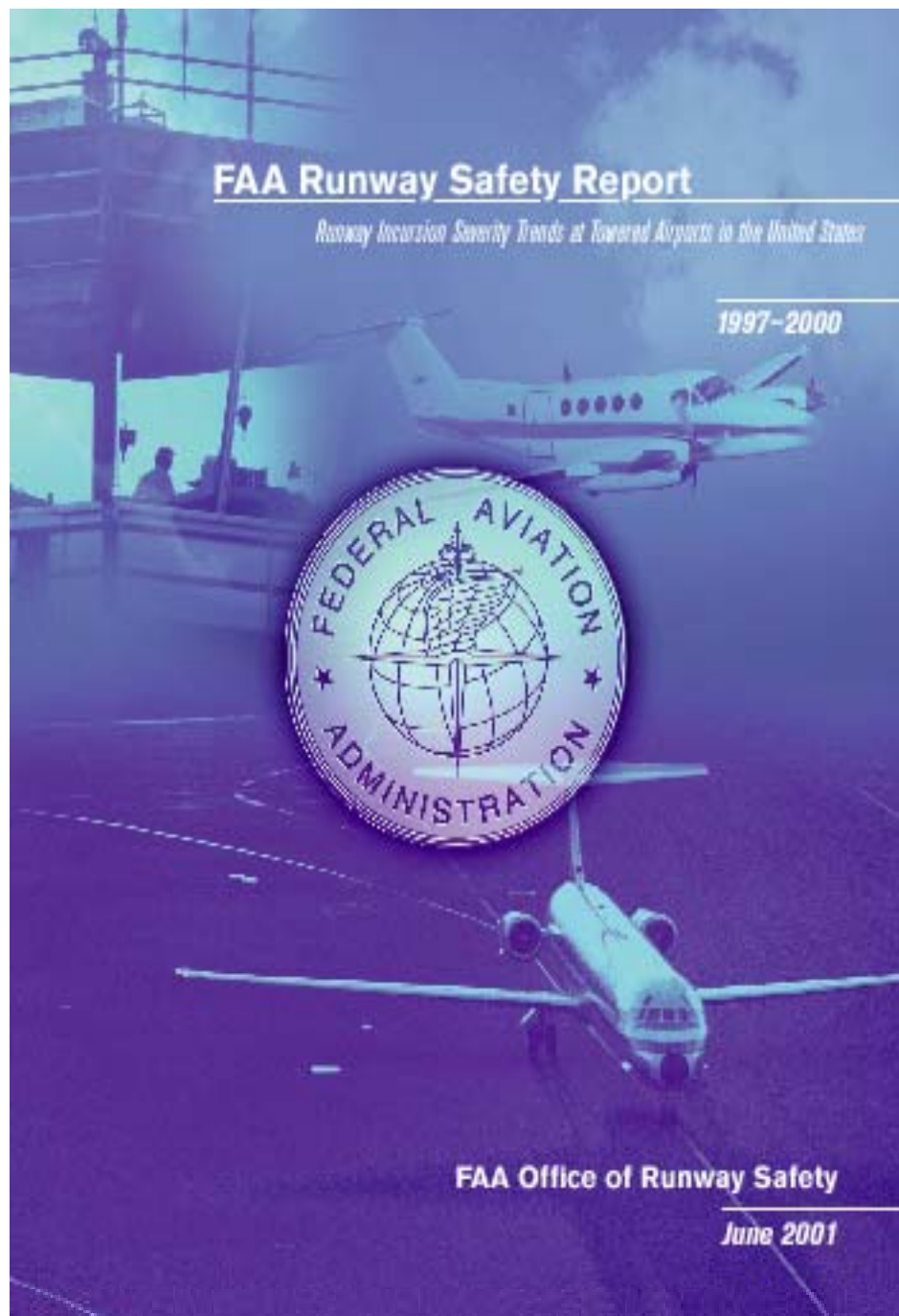
Airport Signs & Markings Quiz

Start Here ➡

Place the number(s) of each sign or marking matching the description in the description box.
(Each sign or marking may be used once, more than once, or not at all.)

A. Indicates you are approaching a runway ....

B. Shows places you should not taxi an aircraft ....

C. Indicates you do, or may, need ATC approval to cross ....

D. Tells you the runway or taxiway you are on ....

E. Sign giving you directions to a runway, taxiway, or other airport destination ....

F. Indicates you're about to enter an area that could cause interference with an ILS signal ....

G. Helps you find your way off a runway ....

H. Confirms you are cleared onto a runway (tower - controlled airport) ....

I. Used to indicate you're about to cross a runway approach or departure path ....

J. Tells you where you should hold short of a crossing taxiway ....

1	2	3	4	**22** 5	**ILS** 6
← B 7	8	9	**14 →** 10	11	12
4-APCH 13	14	(Green Lights ON, Red Lights OFF) 15	16	**RAMP →** 17	5-23 9-27 18
19	20	**10•5 ↑** 21	**B** 22	23	24
25	26	27	**✕ 27** 28	Green Lights OFF, Red Lights ON 29	30
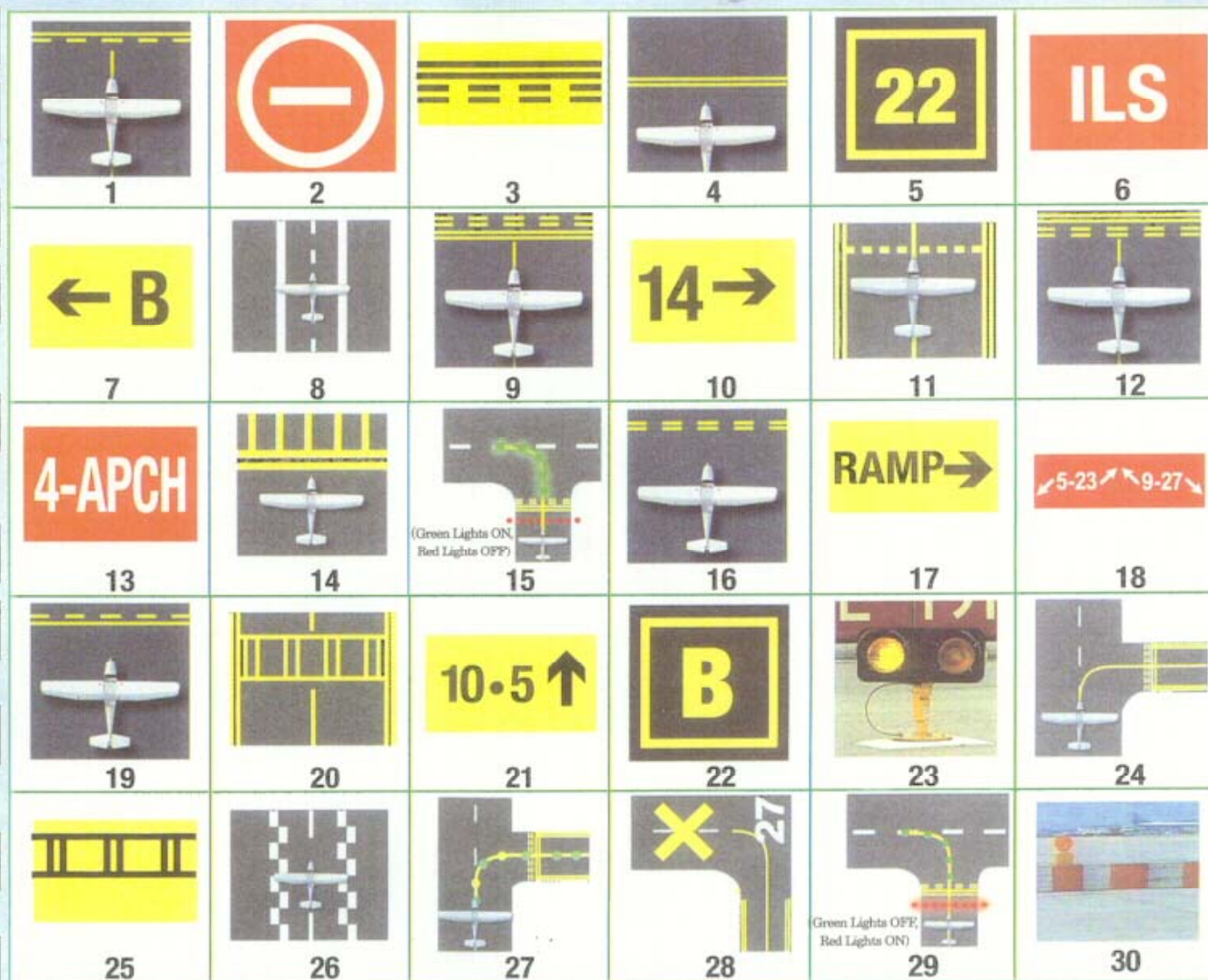
ANM Points of Contact
(ANM Runway Safety Team)

- *Runway Safety Program Manager, ANM-1R, Jim Greene, (425) 227-1369   Jim.k.greene@faa.gov*

- *Airports Division, ANM-600, Mark Taylor, (425) 227-2625   Mark.taylor@faa.gov*

- *Flight Standards, ANM-200, Mary Hoy, (425) 227-2262   Mary.Hoy@faa.gov*

- *Airway Facilities Operations, ANM-400, Willie Eigner, (425) 227-2336   Willie.eigner@faa.gov*

- *Air Traffic Control, ANM-500, Don Bringmann, (425) 227-2550   Donald.bringmann@faa.gov*

We Listen….

We Respond

Pickup Truck versus B-747

Local Problems
require local
Solutions

AIRCRAFT MOVEMENT AREA

STOP

DO NOT PROCEED
WITHOUT CLEARANCE
FROM PAINE TOWER

VEHICLES REQUIRE A
FLASHING AMBER BEACON

AIRCRAFT MOVEMENT AREA

STOP

DO NOT PROCEED WITHOUT CLEARANCE FROM PAINE TOWER

VEHICLES REQUIRE A FLASHING AMBER BEACON

AIRCRAFT TAXIWAY
TOWER CLEARANCE REQUIRED

GATE E-3

YOU ARE ENTERING AN AIR OPERATIONS AREA
AUTHORIZED VEHICLES & PERSONNEL ONLY

VIOLATORS MAY BE PROSECUTED UNDER SNOHOMISH COUNTY CODE 15.08.651

STOP ON YELLOW LINE UNTIL GATE IS FULLY CLOSED BEHIND YOU

UNESCORTED FOLLOW-THROUGH VEHICLES ARE PROHIBITED
PLEASE REPORT VIOLATORS TO AIRPORT SECURITY 353-1606

DO NOT CROSS [yellow line] WITHOUT ATC AUTHORIZATION

YIELD TO ALL AIRCRAFT
SPEED LIMIT 15

Local Problems require local Solutions

- Airport Traffic Control Tower

- Boise Airport

CAUTION: BE ALERT TO RUNWAY CROSSING CLEARANCES
READBACK OF ALL RUNWAY HOLDING INSTRUCTIONS IS REQUIRED.

ATIS 123.9 290.4
BOISE APP CON
119.6 269.4
BOISE TOWER
118.1 257.8
GND CON
121.7 348.6
CLNC DEL
125.9 323.2

GENERAL AVIATION PARKING
IDAHO DEPT OF AERONAUTICS
DE-ICE PAD
ELEV 2826
ELEV 2821

JANUARY 1995 ANNUAL RATE OF CHANGE 0.1°W
VAR 16.3°E

TERMINAL BUILDING
CONTROL TOWER 2945
CUSTOMS
CARGO
NATIONAL INTERAGENCY FIRE CENTER

WIND CONE
0.4% UP
098.8°
WIND CONE

J CARGO
0.4% UP
ARM/DEARM AREA
GENERAL AVIATION PARKING

9763 X 150
10,000 X 150
ELEV 2860

GENERAL AVIATION PARKING
A-4 A-3
A-2 A-1

ANG RAMP
ELEV 2836
ELEV 2836

FIRE STATION
278.8°
WIND CONE

RWY 10L-28R
S75, T200, ST175, TT400, DDT400
RWY 10R-28L
S75, T229, ST175, TT400, DDT400

ELEV 2836
278.8°

DE-ICE PAD

ARMY RAMP HELICOPTERS
0.4% DOWN
ELEV 2855
ELEV 2868

RESTRICTED ACCESS TAXIWAY
ELEV 2840
ARM/DEARM AREA
HOT CARGO ISOLATION AREA

43°34'N
43°33.5'N

Number of Runway Incursions at this location

Number of Surface Incidents at this location

Recent Data for Boise Airport

Runway Incursions & Surface Incidents 1998-2001

Legend:
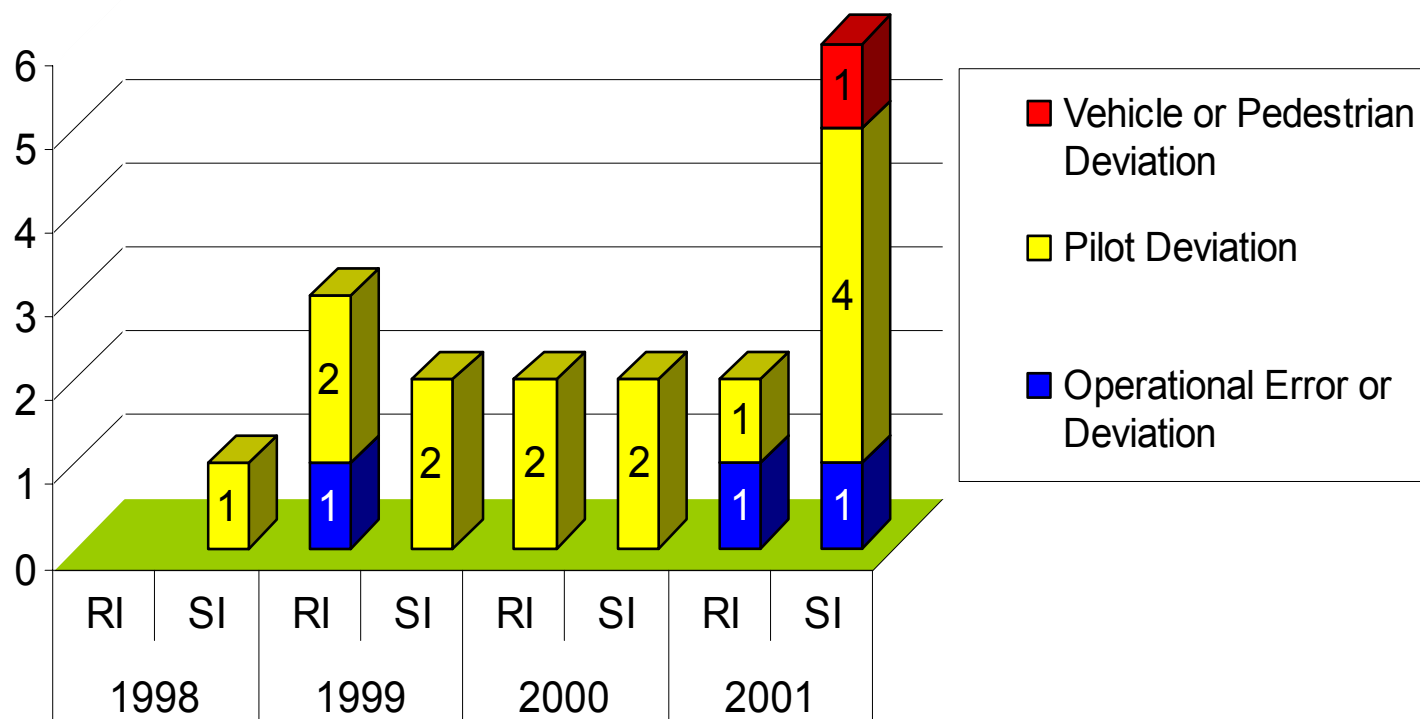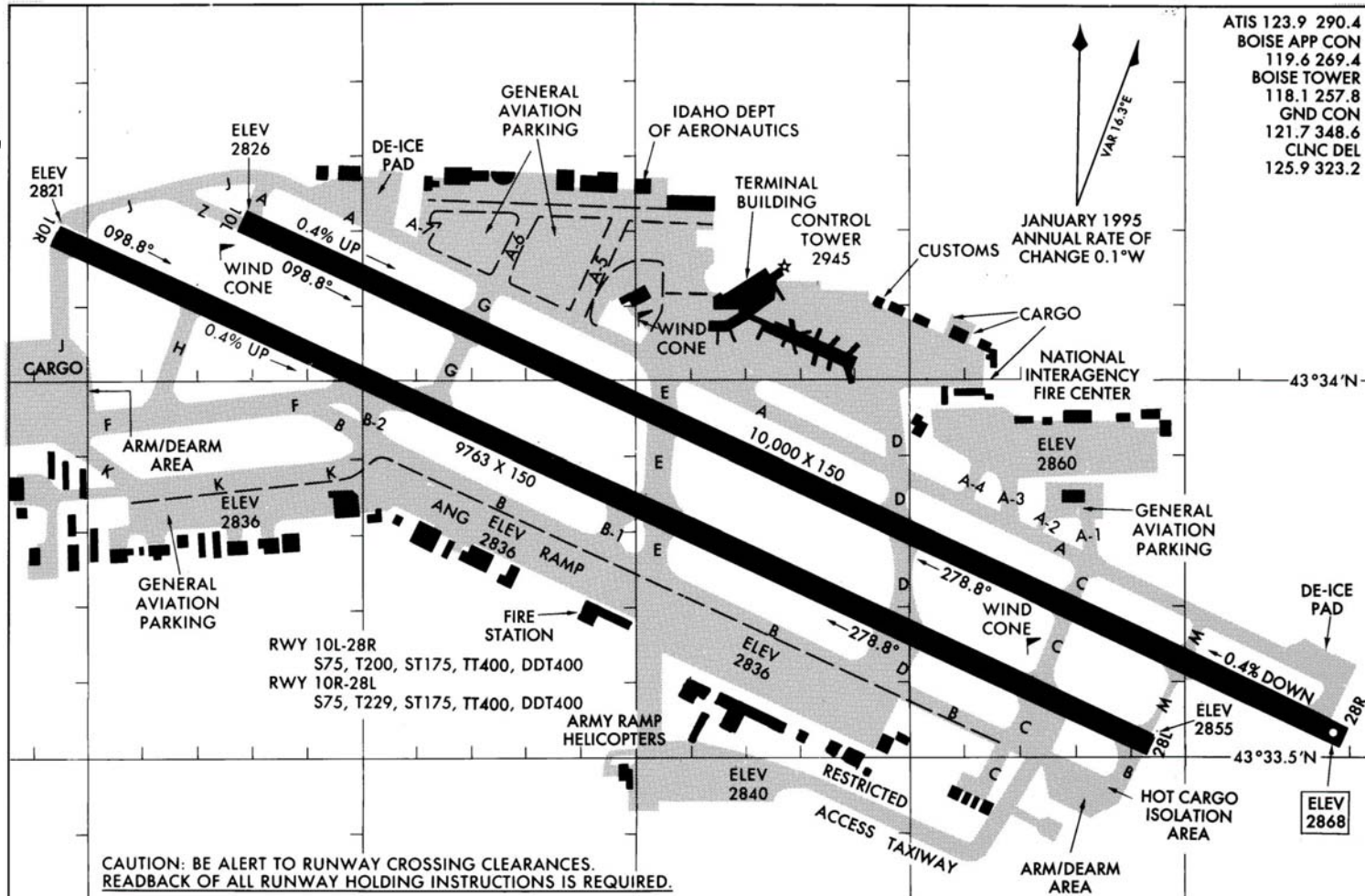- Vehicle or Pedestrian Deviation
- Pilot Deviation
- Operational Error or Deviation

Year	RI	SI
1998		1
1999	1, 2	2
2000	2	2
2001	1, 1	1, 4, 1

Boise
5/21/01
SIPP
Action
Items

PROJECT	Estimated Completion Date	Status / Responsibility
Double the width of taxiway centerlines	7/1/2001	COMPLETED
Current visibility & future service requires a taller tower. Boise ATCT will submit a request for a new tower and base building for FY2004 based on siting survey recommendation provided by Boise Airport Authority.	Proposal due 11/01/2001	BOI ATCT
Airport will install additional signs at approach end of Runway 10L and Twy J	9/1/2001	Signs ordered, awaiting delivery, expect installation by July 1, 2001 / BOI Airport Authority

Runway Incursions 1999

- 11/8/1999   PNMTBOI99006   C   PD

C172 entered Runway 28L without clearance, conflicting with a Bombardier CARJ on takeoff roll.

- 7/27/1999   PNMTBOI99005   D   PD

A BE23, was cleared to land on Runway 28R. Aircraft landed on Runway 28L, which was closed due to vehicle on runway. Inves: pilot stated in an interview he did realize that Runway 28L at Boise was closed and had understood that he was cleared number two after a B-737 to land on Runway 28R. He said he felt two factors created the deviation: his back seat passenger was feeling ill, and he was concerned with the wake turbulence created by the B-737. He admitted that he usually flew out of small airports and that Class C airspace was new to him. The pilot was re-examined.

- 6/14/1999   BOI-T-99-E-001R   C   OE

A C414 was cleared for takeoff on Runway 10L as a C206 started to taxi across same runway.

Runway Incursions 2000

- 10/5/2000 PNMTBOI00003 D   PD

An A310 had just landed and had not exited the runway before a PC-12 started takeoff roll on Runway 10R after receiving instructions to taxi into position and hold.

- 2/19/2000 PNWM-BOI-2000-01   D   PD

A C210 landed Runway 28R after receiving clearance to land 28L. PA28 was already over Runway 28 in front of the C210.

Runway Incursions 2001

- 4/14/2001   PNMTBOI01003   D   PD

A Mooney MO20, called Local Control as he was crossing the hold short lines at Taxiway J and entered the departure end of Runway 10L without authorization and conflicted with a B737 on 1/2-mile final Runway 28R. The B737 was sent around to avoid loss of separation. 1733Z

- 2/23/2001   BOIT01E001   D   OE

Local Control cleared a Piper PA12, to land on Runway 28L with an airport vehicle at west end of runway. The PA12 exited at midfield; closest proximity reported was 5,000 feet horizontal.

Surface Incidents 1998

- 12/1/1998   PD

- A C414 landed on closed runway (10R). Maintenance & Engineering on closed runway. (Originally an RI – reclassified by ATS-20 as an SI.)

Surface Incidents 1999

- 11/10/1999   PD
- C172 cleared to land Runway 28L but instead landed 28R that was closed.   (Originally an RI – reclassified by ATS-20 as an SI.)

- 6/1/1999   PD
- C182 landed closed Runway 28R after being cleared to land Runway 28L.

- 4/27/1999   PD
- A B-737 taxied onto Runway 28R without authorization, conflicting with a twin Cessna on short final and a Dash-8 on departure roll. Traffic was sent around to avoid loss of separation. (Originally an RI – reclassified by ATS-20 as an SI.)

Surface Incidents 2000

- 12/21/2000   PD

A C150 taxied to Runway 10R after receiving and acknowledging instructions for Runway 10L.

- 12/5/2000   PD

A DH-8 crossed Runway 10L and taxied to Runway 10R after receiving instructions to Runway 10L.

Surface Incidents 2001

2/16/2001   PNMTBOI01002   PD

- A Pulsar (experimental), landed on Taxiway A then taxiied across hold lines at Taxiway G and A to Runway 10L without clearance. No conflicts reported.

2/3/2001   PNMTBOI01001   PD

- An Embraer E120, crossed Runway 10L without clearance. No conflicts reported.

Surface Incidents 2001

5/4/2001   PNMTBOI01004   PD

- A DeHavilland DH-8 landed on Runway 28R. A Piper PA42 was cleared to taxi into position and hold for departure on Runway 28R at mid-field (intersection C). A Bombardier CARJ, was on 1¼-mile final. He responded with a squeal (later determined to be caused by a Fairchild SW4 which also acknowledged) and taxied into position. The Fairchild mistakenly took the clearance intended for the PA42 and taxied onto Runway 28R at the approach end. When the Dash 8 cleared the runway, the PA42 was cleared for takeoff, and the Bombardier was cleared to land.

- Seeing two aircraft on the runway, the Bombardier requested verification, which was given. The Bombardier again requested verification, referencing the "two aircraft on the runway." Local Control then issued a Go-Around with the Bombardier on a 1¼-mile final.

- The Fairchild realized his error from the ensuing communications traffic and, concerned about landing traffic, took off without further clearance. The PA42 was airborne and separation existed when the Fairchild departed; no loss of separation occurred between the Fairchild and the PA42.

Surface Incidents 2001

5/25/2001   BOI-T-01-D-001   OE/D

- A C182, called for taxi from Turbo Air. Controller saw a Cessna on the north side of airport in the non-movement area and assumed it was correct aircraft. Aircraft was instructed to taxi to Runway 10L. Aircraft questioned instruction and controller confirmed Runway 10L. Aircraft was actually located at Turbo Air, which is at the south side of airport. Aircraft taxied to Runway 10L, as instructed, which caused the aircraft to cross Runway 10R without the controller completing necessary coordination with Local Controller. No other aircraft involved and no aircraft instructions were amended as a result. 1320Z

Surface Incidents 2001

8/8/2001   VNMTBOI01001   S   V/PD

- A semi-truck left the hanger on the north side of the airport, and proceeded onto Taxiway A-7 without permission. The truck traveled to the service road and exited the airport. No two way communication was established with the vehicle. No loss of separation, no coflicts reported.

8/1/2001   PNMTBOI01006   S   PD

- A Cessna C210, cleared to land Runway 10L instead landed Runway 10R without clearance. A DeHavilland DH8, beyond 2 mile final for Runway 10R, was sidestepped to Runway 10L. No loss of separation reported. 2205Z